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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/823,483 | 04/12/2004 | Avto Tavkhelidze | | 4951 |

7590 02/25/2008
Borealis Technical Limited
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| EXAMINER |
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TAMAI, KARL I

| ART UNIT | PAPER NUMBER |
|----------|--------------|
| 2834 | |

| MAIL DATE | DELIVERY MODE |
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| 02/25/2008 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

| | | |
|------------------------|---------------------|--|
| Application No. | Applicant(s) | |
| 10/823,483 | TAVKHELIDZE ET AL. | |
| Examiner | Art Unit | |
| KARL I.E. TAMAI | 2834 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 22 January 2008.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-14 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-14 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date _____.
- 5) Notice of Informal Patent Application
- 6) Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-7 and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shakouri et al. (Shakouri)(US 5955772) and Fitzpatrick ("Close-Spaced Thermionic Converters with Active Spacing Control and Heat Pipe Isothermal Emitters", in further view of Huffman ("Preliminary Investigations of a Thermotunnel Converter"). Shakouri teaches a vacuum thermionic heat pump with a cathode and anode 12, 16 spaced from each other across a vacuum 14, and an external circuit with a power source. Sakouri teaches spacing of .01 to 1 micron (100-10K Angstroms)(col. 7, line 49). Shakouri

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teaches every aspect of the invention but does not teach a positioning means for positioning the electrodes or capacitor sensors or the spacing being less than 200 Angstroms. Fitzpatrick teaches a capacitor sensors and piezoelectric actuators (see page 924) to position the electrodes in a thermal energy transfer device. Fitzpatrick teaches three sensors and three actuators to maintain the parallel surfaces, which suggests independent control of the actuator by the microprocessor. Huffman teaches the closing spaced electrodes cause a qualitative increase in the operation of thermionic devices, such as 10 angstroms. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the heat pump of Shakouri with the actuators of Fitzpatrick to provide adjustable electrodes of increased efficiency and power density, and with the spacing being less that 200 Angstroms to causing tunneling to improve the qualitative operation of the device as taught by Huffman.

4. Claims 8 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shakouri et al. (Shakouri)(US 5955772) and Fitzpatrick ("Close-Spaced Thermionic Converters with Active Spacing Control and Heat Pipe Isothermal Emitters") and Huffman , in further view of Richards (US 4281280). Shakouri, Fitzpatrick, and Huffman teach every aspect of the invention except the inert gas argon between the electrodes. Richards teaches the region between the electrodes can be either evacuated or filled with an inert gas such as argon to transport energy from the emitter to the collector. It would have been obvious to a person of ordinary skill in the art at the time of the invention to construct the machine of Shakouri, Fitzpatrick, and Huffman with the region

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between the electrodes being evacuated or filled with argon because Richards teaches that the vacuum or argon allows the transportation of electrons from the cathode to the anode, and because it has been held that selection of known equivalents is within the ordinary skill in the art.

Response to Arguments

4. Applicant's arguments filed 1/22/2008 have been fully considered but they are not persuasive. Applicant's argument that Huffman does not teach a qualitative increase at 10 angstroms is not persuasive. Huffman teaches on page 574 that the quantitative space of 10 angstroms leads to a qualitative difference in the operation of the device by the tunneling of electrons over the potential barrier. The statement is not conclusory because the motivation is literally provided by the reference. Applicant's argument the spacing is not possible is not persuasive. Huffman teaches thermionic device was operation, just at an efficiency less than expected. Huffman spacing and motivation are supported by King (Results from Microminiature Thermionic Converter Demonstration Testing Program) (pg 1434, third paragraph) stating "the ideal gap size is zero. As the gap size increases the diode current decreases due to the space charge effects from one electron to the other". King further shows on page 1435 that the best efficiencies are with the smallest gap size, particularly below 200 angstroms.

Furthermore, caselaw supports the position that determining the optimum range is within the ordinary skill in the art, see *In re Aller*, 105 USPQ 233 holding that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or

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workable ranges involves only routine skill in the art. (see *In re Aller*, 105 USPQ 233).

The rejection is proper and maintained.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karl I.E. Tamai whose telephone number is (571) 272 - 2036.

The examiner can be normally contacted on Monday through Friday from 8:00 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Darren Schuberg, can be reached at (571) 272 - 2044. The facsimile number for the Group is (571) 273 - 8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Karl I Tamai/
PRIMARY PATENT EXAMINER
February 27, 2008